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Abstract

CHLORINATION AT ELEVATED TEMPERATURES AS A VERSATILE URANIUM ORE CONCENTRATION METHOD

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With the aim to find more economic uranium ore concentration methods attention has been drawn to the possibility of chlorine attack at elevated temperatures. New, detailed research work has been performed concerning the reaction of chlorine with uranium oxides and uranium minerals at different temperatures and this with pure chlorine as well as in presence of reducing agents: carbon and carbon monoxide. The mechanism and kinetics of the reactions has been studied with the aid of the radioisotope Cl-36 acting as a tracer. This research work revealed an important fact that the reaction of uranium dioxide with chlorine proceeds already at 225°C, uranyl chloride UO_2Cl_2 being formed, while chlorination of U_3O_8 as well as of UO_3 in presence of carbon preceeds at 300°C.

The results thus obtained may be used as a basis to develop different technological schemes which may be adapted to different ore types. The decisive role is played by the content of other valuable elements contained in ores which form volatile or extractable chlorides in the same process /e.g. titanium, vanadium, molybdenum, niobum and tantalum/. Possibilities for anhydrous aluminum chloride and silicon chloride production in the same process also exist, both being valuable by-products.

A new, high-efficient apparatus to perform reactions of granular solids with gases at elevated temperatures has been developed.

Chlorination is considered to be a general, intense and versatile uranium ore processing method.